REMARKS/ARGUMENTS

Claims 1-11 and 16-20 stand in the present application. Reconsideration and favorable action is respectfully requested in view of the following remarks.

In the Office Action, the Examiner has rejected claims 1-4, 7-11 and 18 under 35 U.S.C. § 102(e) as being anticipated by Otsuka et al., has rejected claims 5, 6, 16 and 17 under 35 U.S.C. § 103(a) as being unpatentable over Otsuka et al. in view of Kleijn et al., and had rejected claims 19 and 20 under 35 U.S.C. § 103(a) as being unpatentable over Mitsumi in view of Otsuka et al. Applicants respectfully traverse the Examiner's §§ 102 and 103 rejections of the claims.

Applicants' invention relates to methods and apparatus for waveform synthesis (i.e., methods and apparatus for generating a cyclic sound waveform, as per independent claims I and 18 to 20), and particularly but not exclusively for speech synthesis (i.e., methods and apparatus for generating a synthetic voiced waveform, as per independent claims 16 and 17).

A waveform is synthesized by initially selecting a synthetic waveform sample value, then generating a sequence of further sample values and finally outputting the samples of the sequence to generate a waveform. The further sample values are generated based jointly upon the value of the immediately preceding sample value and upon a model of the dynamics of an actual waveform similar to that being generated, and in particular upon data modeling the evolution, over a short time interval, of the waveform to be synthesized. A waveform synthesizer is thus provided that avoids the unnatural sounds that results from repeating a short segment of a recorded sound several times in sequence, as is the case in previous waveform synthesizers.

The Examiner has again rejected claims 1 and 18. Both claims I and 18 include the claim feature of "a cyclical sound waveform sample." A "waveform" is defined in the Federal Standard 1037C, Glossary of Telecommunications Terms, 1996 as "the representation of a signal as a plot of amplitude versus time." A "sound waveform" is therefore a representation of a sound signal as a plot of amplitude versus time and a "cyclical sound waveform" is therefore a sound waveform "occurring in cycles." Federal Standard 1037C also defines a "signal sample" as "the value of a particular characteristic of a signal at a chosen instant."

The US Manual of Patent Examining Procedure, at section 2111.01, states that claim terms are presumed to have the ordinary and customary meanings attributed to them by those of ordinary skill in the art. The MPEP also states at section 2141.03 that the person "having ordinary skill in the art to which the claimed subject matter pertains would, of necessity have the capability of understanding the scientific and engineering principles applicable to the pertinent art."

The claim feature "cyclical sound waveform sample" would therefore be interpreted by one of ordinary skill in the art as the value of the amplitude of a cyclical sound signal at a chosen instant in time. It is also worth pointing out at this stage that this accords with the second of the definitions given by the Examiner in section 9 of the Office Action. The Examiner states that in "The Authorative Dictionary of IEEE Standards and Terms" seventh edition, 2000, page 1000, the term "sample data" is defined as "data in which the information content can be, or is, ascertained only at discrete interval of time." The word "discrete", according to the Concise Oxford Dictionary 10th edition, means 'individually separate and distinct." Therefore, according

to the Examiner's definition, a waveform sample is the information associated with the waveform which has been ascertained at an individually separate and distinct interval of time. A person of ordinary skill in the art, having read the description of the present application, and faced with the two definitions cited by the Examiner would realize that the second definition (discussed above) is the most consistent with the Applicant's use of the terms.

It is respectfully submitted that the Examiner has still failed to clearly indicate where the claim feature of "cyclical sound waveform sample", as interpreted above, can be found in Otsuka. At times the Examiner seems to suggest that this claim feature is anticipated by the feature in Otsuka of "a parameter of a frame to be processed." However, a parameter of a frame to be processed is extracted from a parameter series. A parameter series is generated for each frame and an example of the data contained within a parameter series is given in figure 8. It is clear from this figure that a parameter series comprises three separate parameters all of which apply over one whole frame. In the first instance, since the parameters all apply over one whole frame, they cannot be described as a value of the aptitude of a speech signal at a chosen instant. In the second instance none of the three parameters comprise a cyclical sound waveform. Therefore, in no way can a parameter of a frame to be processed, as found in Otsuka, be said to anticipate the claim feature of a "cyclical sound waveform sample."

In other parts of the Office Action the Examiner seems to suggest that the Otsuka feature of a "pitch waveform" anticipates the claim feature "cyclical sound waveform sample." As will be clear from the above discussion of the term "cyclical sound waveform sample," a pitch waveform cannot be said to be a waveform sample. The

Examiner's interpretation of the feature pitch waveform to be a "cyclical sound waveform sample" is inconsistent with what the Examiner has written in section 9 of the Office Action, where he states that the term pitch waveform "is substantially similar cycles", another claim feature of claims I and 18. Taking all the above into account, it is submitted that both claims 1 and 18 define novel and inventive subject matter over Otsuka. Dependent claims 2 to 11 are all dependent on independent claim I and are therefore arguably novel and inventive at least by virtue of that dependency.

Turning now to independent claims 16 and 17, the Examiner rejects these claims as being unpatentable over Otsuka in view of Kleijn. Both these claims include the claim feature of "state space representations of voiced speech signals" and the Examiner contends that the Otsuka teaches said claimed feature. In a state space representation, different axes of state space consist of waveform values separated by predetermined timed intervals, so that a time in state space is defined by a set of values at times t_1, t_2, t_3 (where $t_2-t_1=\Delta t_1$ and $t_3-t_2=\Delta t_2$, which are both constants and may be equal). In the example given on pages 4 and 5 of the present application to produce a state space representation of a time sequence X, a plurality of values (in this case three) of a waveform at spaced apart times X_{i-10}, x_i, x_{i+10} are taken and combined to represent a single point s_i, in a space defined by a corresponding number of axis (in this case three). This is totally different from simply an amplitude versus time plot of a waveform (as shown in Figure 11 of Otsuka and cited by the Examiner), which cannot under any circumstances be said to be even a two dimensional state space representation. Otsuka, therefore, does not teach the claim feature of "state space representations of voiced speech signals" and therefore there will be no reasonable

expectation of success in combining Otsuka with Kleijn. The Examiner has therefore failed to establish a prima facie case of obviousness against claims 16 and 17.

Turning finally to independent claims 19 and 20, the Examiner has rejected these claims as being unpatentable over Mitsumi in view of Otsuka. Mitsumi discloses a device that is operable to smoothly connect together a repetitively output waveform. This is achieved by an interpolation operation in specified sections at the end and start of the waveform that smoothes the amplitude change of the waveform in the interpolation section. The passage cited by the Examiner (column 3, lines 30 to 63) describes how there is a discontinuity between a section at the end of a repeated cycle and a section B at the beginning of a next repeated cycle. In this area of discontinuity a wave shape signal based on an approximate value obtained by an interpolation operation is used thus smoothly connecting sections A and B. Where in this section of Mitsumi does it disclose "generating a first instantaneous value of the amplitude of a cyclical sound waveform" and subsequently "generating a second instantaneous value of the amplitude of a cyclical sound waveform from said first instantaneous value." Furthermore, and as already mentioned above, Mitsumi discloses a device that is operable to smoothly connect together a repetitively output waveform. This is precisely the sort of device that the present invention seeks to improve upon by eliminating the need to record stored segments of a waveform and outputting them in sequence (sec PCT application as published page 1, lines 5 to 20). There will thus be no motivation to modify Mitsumi since there would be no reasonable expectation of success in providing a waveform synthesizer that avoids the unnatural sound that results from repeating a short segment of a recorded sound several times in sequence. The Examiner has,

therefore, failed to establish a prima facie case of obviousness against independent claims 19 and 20.

Therefore, in view of the above remarks, it is respectfully requested that the application be reconsidered and that all of claims 1-11 and 16-20, standing in the application, be allowed and that the case be passed to issue. If there are any other issues remaining which the Examiner believes could be resolved through either a supplemental response or an Examiner's amendment, the Examiner is respectfully requested to contact the undersigned at the local telephone exchange indicated below.

Respectfully submitted,

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